Drill Problems
Day 2
Drill Problem 2.1

1. VIs to be used: s051_MechActionOfBooleans.vi (The VI is already complete.)
2. Objective: To examine the different types of mechanical action settings of Boolean switches.
3. Estimated time: 10–15 minutes
4. Related chapter: Chapter 5
5. Key objects, VIs, and functions in this drill problem: N/A
6. Instructions
   Open the VI and observe the effect of different mechanical action settings. The VI is complete already.

Drill Problem 2.2

1. VIs to be used: p052_MultiChChartGraph.vi (Template provided.)
2. Objective: To learn how to plot multichannels of data on a Waveform Chart and a Waveform Graph.
3. Estimated time: 20–25 minutes
4. Related chapter: Chapter 5
5. Key objects, VIs, and functions in this drill problem:
   Controls >> Graph >> Waveform Chart and Waveform Graph

Figure D2.2(a)
Functions >> Array >> Build Array
Functions >> Cluster >> Bundle

6. Instructions
Complete the VI as shown in Figure D2.2. There are a Waveform Chart and a Waveform Graph, inside and outside the While Loop, respectively. To create a constant for the Attribute Node of Waveform Chart and the Local Variable of Waveform Graph, use the pop-up menu of each.

Drill Problem 2.3

1. VIs to be used: p053_MultiChGphXo.vi (Template provided.)
2. Objective: To learn how to plot multichannels of data on a Waveform Graph with different starting points and intervals of x-axis.
3. Estimated time: 30–35 minutes
4. Related chapter: Chapter 5
5. Key objects, VIs, and functions in this drill problem:
   Functions >> Cluster >> Bundle
   Functions >> Array >> Build Array
6. Instructions

Complete the VI as shown in Figure D2.3. The Boolean switch wired to the *conditional terminal* of the **While Loop** has the default value of TRUE with mechanical action **Latch When Released**.
Drill Problem 2.4

1. VIs to be used: p054_MultiChXYGph.vi (Template provided.)
2. Objective: To learn how to plot multichannels of data on an XY Graph and compare its functionality with that of Waveform Graph.
3. Estimated time: 30–35 minutes
4. Related chapter: Chapter 5
5. Key objects, VIs, and functions in this drill problem:
   Controls >> Graph >> XY Graph and Waveform Graph
   Functions >> Cluster >> Bundle
   Functions >> Array >> Build Array
6. Instructions
   Complete the VI as shown in Figure D2.4. Note that the Boolean switch in the While Loop has the default value of TRUE with mechanical action Latch When Released.

Figure D2.4(a)
Drill Problem 2.5

1. VIs to be used: p061_ArryPrac.vi (You need to create a new VI.)
2. Objective: To learn how to build a matrix or a vector from multiple vectors and study the different input settings of Build Array.
3. Estimated time: 15–20 minutes
4. Related chapter: Chapter 6
5. Key objects, VIs, and functions in this drill problem:
   Controls >> Array & Cluster >> Array
   Controls >> Numeric >> Digital Control and Digital Indicator
   Functions >> Array >> Build Array

Figure D2.5(a)
6. Instructions
Complete the VI as shown in Figure D2.5. Run the VI to see the effect of two different input settings of Build Array: Element Input and Array Input. Element Input setting increases the dimension of the input array, whereas Array Input setting concatenates the input arrays, maintaining the same dimension.

Drill Problem 2.6

1. VIs to be used: p062_ClustrFcnPrac.vi (You need to create a new VI.)
2. Objective: To learn how to build a cluster of arrays and extract arrays from it conversely. You may skip this drill problem if necessary.
3. Estimated time: 15–20 minutes
4. Related chapter: Chapter 6
5. Key objects, VIs, and functions in this drill problem:
   Controls >> Array & Cluster >> Cluster and Array
   Functions >> Cluster >> Build Cluster Array and Index & Bundle Cluster Array
6. Instructions
Complete the VI as shown in Figure D2.6. “cluster(x)” indicates a cluster whose element is an array x. “cluster(1,4,7)” indicates a cluster whose elements are the 1st, 4th, and 7th elements of the input arrays.
The order of each element is as follows: \( x \) has the 1st, 2nd, and 3rd elements; \( y \) has the 4th, 5th, and 6th elements; and \( z \) has the 7th, 8th, and 9th elements. In this drill problem, the order of each element happens to be identical to the value itself.

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**Figure D2.6(a)**

![Figure D2.6(a)](image)

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**Figure D2.6(b)**

![Figure D2.6(b)](image)
Drill Problem 2.7

1. VIs to be used: p063_IntstyGphPxlByPxl.vi (Template provided.)
2. Objective: To learn how to display 2-D array data using an Intensity Graph, which can especially be useful if the 2-D array data represent an image. You may skip this drill problem if necessary.
3. Estimated time: 40 minutes
4. Related chapter: Chapter 6
5. Key objects, VIs, and functions in this drill problem:
   Controls >> Graph >> Intensity Graph
   Controls >> Numeric >> Color Box

![Intensity Graph](image_url)

![Color Setting Control](image_url)

![Output Array](image_url)

*Figure D2.7(a)*
Controls >> Array & Cluster >> Array  
Functions >> Structures >> Sequence  
Functions >> Array >> Initialize Array and Replace Array Element

6. Instructions
Complete the VI as shown in Figure D2.7.
Drill Problem 2.8

1. VIs to be used: `p064_IntstyGphAttNode.vi` (Template provided.)
2. Objective: To learn more about how to display 2-D array data using an **Intensity Graph**. You may skip this drill problem if necessary.
3. Estimated time: 40 minutes
4. Related chapter: Chapter 6
5. Key objects, VIs, and functions in this drill problem:
   - **Controls >> Graph >> Intensity Graph**
   - **Controls >> Numeric >> Color Box**
   - **Controls >> Array & Cluster >> Array**
   - **Functions >> Structures >> Sequence**
   - **Functions >> Numeric >> Trigonometric >> Sine and Cosine**
6. Instructions
   Complete the VI as shown in Figure D2.8.

![Intensity Graph](image-url)

*Figure D2.8(a)*
Drill Problem 2.9

1. VIs to be used: \texttt{p065\_Arry\&ClustrUpdPrac.vi} (Template provided.)
2. Objective: To learn how to index elements in clusters and arrays.
3. Estimated time: 40 minutes
4. Related chapter: Chapter 6
5. Key objects, VIs, and functions in this drill problem:
   \textbf{Controls $\gg$ Numeric $\gg$ Digital Control}
Controls >> Boolean >> Square LED and Round LED
Controls >> Array & Cluster >> Array
Functions >> Cluster >> Unbundle and Unbundle By Name
Functions >> Array >> Replace Array Element

6. Instructions

Complete the VI as shown in Figure D2.9. This drill problem consists of two parts: updating elements in a cluster, and indexing elements in an array. The first part is the left portion of the front panel, and the second part, the right portion of the front panel.

**Figure D2.9(a)**

**Figure D2.9(b)**